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Comparison of Xylazine and Dexmedetomidine as preanesthetics for Zolazepam-Tiletamine anesthesia in Sloth bears (*Melursus ursinus*)

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ABSTRACT
A comparative study conducted on six sloth bears each in Group A and B which were immobilized with Xylazine (1.33mg/kg) + Zolazepam-Tiletamine (2mg/kg) and Dexmedetomidine (6µg/kg) + Zolazepam-Tiletamine (2mg/kg) intramuscularly respectively using blow pipe and dart. In Group A, the induction-time, anesthetic-duration and recovery-time were 10.50 ± 0.43minutes, 64.00 ± 2.07minutes and 66.17 ± 10.27minutes respectively; while in Group B, 8.50 ± 0.43minutes, 41.67 ± 1.06minutes and 57.17 ± 2.21minutes respectively. DexMZT was comparatively superior to XZT due to its faster and smoother induction, longer maintenance period with good muscle relaxation and absence of adverse effects with a smooth predictable recovery.
Key words : sloth bears, anesthesia and recovery.

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INTRODUCTION

Bears need to be restrained in order to aid in rescue, in areas of human bear conflict, during translocation, marking, research purposes or for medical management of sick bears both in captive and wild conditions. Drug combinations like Xylazine – Ketamine and Medetomidine – Ketamine are unreliable in bears and sudden recoveries may be encountered, hence it is better to avoid these combinations in most of the situations. Tiletamine – Zolazepam produces suitable anesthesia with predictable signs of recovery [3]. An ideal anesthetic drug should have a high therapeutic index, short induction period and be non-irritant to the muscle tissue. The drug should be stable, the concentration should be high enough to allow its use in small volume, produce smooth and fast recovery. The reversal agent should be readily available. [5].

MATERIAL AND METHODS

Twelve sloth bears of either gender with different body weights were randomly selected during the course of routine general health examination and divided into two groups like A and B consisting of six bears each for the study at the Wildlife SOS, Bannerghatta Bear Rescue Center in Bengaluru. Bears were darted with blowpipe intramuscularly. Bears in Group A were immobilized with Xylazine (1.33 mg / kg) + Zolazepam- Tiletamine (2mg/kg) and Group B with Dexmedetomidine (6.0 µg/ kg) + Zolazepam-Tiletamine (2mg/kg).

Blood samples of about 5ml were collected from jugular vein with EDTA and serum vials at 15, 30, and 60 minutes after anesthetic administration. The hematological and biochemical parameters were evaluated using Mindray, BC-2800Vet-auto-analyzer and Thermoscientific Konelab-20 fully automatic biochemical analyzer respectively. The 0 minute / normal values were considered as per the book standards [7]. The physiological parameters like Rectal temperature (^{o}F), Heart rate (beats/minute), Respiratory rate (breaths/minute) were recorded using the OT Vet. Patient Monitor at 15, 30, 60 minutes after anesthetic administration and the 0 minute/Normal values were considered as per book standards [4]. The mean

and standard error of the data were computed and statistically analyzed by "t" tests using computer based statistical programme and Graph pad prism.

RESULTS AND DISCUSSION

Mean induction total dose of XZT was Xylazine (104.3 ± 6.44mg) and ZT(157.0 ± 9.64mg) ranging 84mg-132mg of Xylazine and 126mg-198mg of ZT. XZT was induced with similar ratio 2:3 of induction as reported by [1, 2]. The mean induction total dose of DexMZT was DexM (367.0 ± 70.61µg) and ZT (122.3 ± 23.54mg) ranging 162µg-540µg of DexM and 54mg-180mg of ZT with reference to Jin *et al*., [6] and Teisberg *et al*. [10]. In group A the induction time, anesthetic duration and recovery time were 10.50 ± 0.43minutes, 64.00 ± 2.07minutes and 66.17 ± 10.27minutes respectively; while in group B 8.50 ± 0.43minutes, 41.67 ± 1.06minutes and 57.17 ± 2.21minutes respectively. Significant difference ($P < 0.01$) was observed with group B inducing faster than group A which could be because DexM has more $\alpha_2 : \alpha_1$ selectivity and higher volume of distribution than Xylazine [8]. The difference between group A and B in anesthetic duration was significant ($P < 0.0001$) which could be influenced by potency of the preanesthetics as the ZT dose was administered at a fixed dose of 2 mg/kg in both groups. Mild bradycardia at 15 minutes after DexMZT administration was observed but the values returned to normal. Recovery patterns recorded were blinking and muzzle movements at 41.67 ± 1.06 and 64.00 ± 2.07 minutes in group A and B respectively($P < 0.0001$). Paw movements at 53.67 ± 2.89 and 77.17 ± 3.89 minutes in group A and B respectively ($P < 0.001$). Head lifting at 68.50 ± 4.38 and 95.83 ± 8.77 minutes in group A and B respectively ($P < 0.05$). Sternal recumbence at 98.83 ± 2.24 and 130.2 ± 10.77 minutes in group A and B respectively ($P < 0.05$). Significant difference in recovery could be due to the short elimination half-life of Xylazine which is earlier than DexM [8]. Skeletal muscle relaxation and jaw relaxation was better in all bears of group B compared to group A bears. Mild salivation and mild retching were observed in group A while in group B salivation was absent and mild retching was observed only in one bear.

Hematological values were within normal range but there was significant difference ($P < 0.05$) between the values of neutrophils between group A (67.00 ± 0.68%)and B(60.83 ± 2.24%) at 30 minutes showing very less stress response in group B which could be attributed to DexM as the induction time of anesthesia was faster and calmer causing lesser physical exertion. In group B hemoglobin concentration and PCV at 15, 30, 60 minutes was (14.33 ± 0.51, 13.88 ± 0.59, 15.10 ± 0.21g/dl) and (38.87 ± 1.87, 36.32 ± 1.37, 41.07± 0.87%) respectively and in group A (14.50 ± 0.35, 13.92 ± 0.27, 15.27 ± 0.18g/dl) and (42.98 ± 2.44, 42.57 ± 2.59, 43.72 ± 0.91%) respectively. There was a significant decrease of ($P < 0.05$) and ($P < 0.01$) in haemoglobin concentration and PCV at 30minutes which could be due to α_2 adrenergic agonists influencing shifting of the fluids from extracellular to intracellular compartments in order to maintain the cardiac output. The difference could also be due to the fluid therapy which causes hemodilution. The difference was more in group B which could be because DexM has the property to preserve blood flow to vital organs including heart, brain, liver and kidneys at the expense of lesser important organs like pancreas and skin as stated by Rafee *et al*. [9]. There was no significant difference in biochemical values during anesthesia and the values returned to normal range at 60 minutes.

SUMMARY

XZT and DexMZT combinations of anesthesia lasting 41.67±1.06 and 64.00±2.07 minutes respectively were found to be effective in sloth bears for general examination and minor surgical interventions. Anesthetic induction and recovery pattern were smoother and more predictable with quicker induction time, good muscle relaxation and longer duration of anesthesia in group B due to higher α_2 selectivity and prolonged recovery time due to longer half-life than group A. Incidences of side effects were more in group A than group B. Hematological parameters viz. TEC, TLC, Hemoglobin, PCV and DLC were analyzed. Biochemical parameters viz. ALT, AST, BUN, Serum Creatinine, Total Proteins, and Glucose were also analyzed. Significant difference between neutrophil values at 30 minute with higher neutrophil count in group A was observed. This indicated lesser exertion during DexMZT anesthesia in group B. In conclusion, DexMZT combination was found to be superior compared to the XZT because of its faster and smoother induction, longer maintenance period and lesser side effects in sloth bears.

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